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Chief, Research & Development Branch

7 December 1956

Chief, Research & Development Laboratory

[redacted] Ferrite Video Detector

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1. Following a verbal request of 6 November 1956, an evaluation of a ferrite video detector was conducted by the R&D Laboratory. The primary objective of this evaluation was to determine the difference between the relative gain of the ferrite antenna and the dipole antenna. The secondary objectives were to measure the impedance of the ferrite antenna and the input impedance of the tunable matching transformer with the crystal detector intact. These tests were conducted over the frequency range from 50 mcs. to 250 mcs.

2. The ferrite video detector consists basically of a ferrite antenna, matching transformer, and a crystal diode. The antenna is constructed of a 5 3/4" ferrite rod with 3 full turns of thin copper strip which is wound to cover 5 inches of the ferrite rod length. The matching transformer is a balanced primary to an unbalanced secondary with a one to one turns ratio. The secondary of the transformer is paralleled by a variable capacitor which is tuned by a micrometer control. The crystal diode is terminated at the mid-point of the transformer secondary winding. The complete unit is housed in a clear transparent plastic case.

3. The gain measurement tests were conducted in an open field with no obstructions within approximately 100 feet of the test location. A GR signal generator modulated 30% at 1000 cycles was used to feed a dipole antenna to provide a radiated field. The distance between the transmitter and the receiving unit was approximately 75 feet. The detector output was fed to a vacuum tube voltmeter via a pre-amplifier. The gain measurements were taken with each antenna (dipole and ferrite) alternately coupled to the input of the matching transformer. After exhaustive efforts were made, these tests were suspended because of the extreme difficulty encountered in obtaining reliable and repetitive test data. The factor which influenced the decision to suspend the gain measurement tests was the inability to accurately tune the unit to resonance. This was due to the sharp selectivity of the detector tank circuit and the effects of hand and body capacity which caused serious detuning of the detector. The very high Q of the tuned circuit in the antenna made the frequency stability of the available signal generator a serious problem.

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4. The impedance measurements of the ferrite antenna and the matching transformer were made with each component connected directly across the unbalanced measuring terminals of a Boonton RX Meter, type 250 A. Spot impedance checks of the ferrite antenna and the matching transformer were made using a half-wave balun. The results were essentially the same for both methods of measurements. The test results of the video detector impedance measurements are tabulated and are shown in graph form.

5. The impedance tests indicate that the series impedance of the ferrite antenna varies from 82.7 + j 350 ohms at 50 mcs., 1550 + j 0 ohms at 120 mcs., to 115 - j 199 ohms at 250 mcs. The input impedance of the matching transformer and the crystal diode detector, measured at resonance, was 17.5 ohms at 50 mcs., 550 ohms at 150 mcs., and 2600 ohms at 250 mcs. The division of the resistive component between radiation resistance and ohmic loss could not be made with the equipment which was available.

6. The Ferrite Video Detector is considered to be unsatisfactory from an operational standpoint due to the extremely poor tuning characteristics of the detector tank circuit. No definite conclusions concerning the relative gain of the ferrite antenna when compared to the standard dipole can be given, however, a very rough figure of -15 db for the average gain over the frequency band was obtained.

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Attachments (2)
Lab/JFS/jcm (10 December 1956)

Distribution: Original and 1 - Addressee
1 - R&D Lab
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